Supplement to "An Iterated Local Search Algorithm for Solving the Generalized Team Orienteering Problem with Time Windows"

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1 Detailed Solutions

The detailed solution values obtained by our proposed algorithm, an Enhanced Iterated Local Search Algorithm, are presented. Table 1 summarizes the details of the instances. [1] classified the first two sets of instances as the "INST-M" category while the third one is classified into the "OPT" category.

Table 1: Benchmark instances.

References	Instances	Names	$\|N\|$	m
[2]	Solomon	c^*_100, r^*_100, rc^*_100	100	1 to 4
	Cordeau	$pr01$ - $pr10$	[48, 288]	
[3]	Solomon	c^*_200, r^*_200, rc^*_200	100	1 to 4
	Cordeau	$pr11$ - $pr20$	[48, 288]	
[4]	Solomon	c^*_100, r^*_100, rc^*_100	100	up to number of vehicles
		c^*_200, r^*_200, rc^*_200	100	
	Cordeau	$pr01$ - $pr10$	[48, 288]	

The performances of the proposed ILS in solving the benchmark instances are compared to the state-of-the-art methods: Ant Colony System (ACS) [3], Enhanced Ant Colony System (Enhanced ACS) [5], Slow Simulated Annealing (SSA) [6], Granular Variable Neighborhood Search (GVNS) [7] and Iterative Three-Component Heuristic (I3CH) [1]. The algorithm proposed by [5] has been empirically shown to outperform the original ACS [3]. Here, we refer to the results of both papers, whichever is better and denote them as ACS*. All results of above-mentioned algorithms have been summarized by [1], please refer to http://www.computational-logistics.org/orlib/topic/TOPTW/ for the details. Here, we report the results of our proposed ILS.

Tables 2, 3, 4 and 5 show the solution values obtained by ILS on the instances from the two sets "Solomon 100" and "Solomon 200" with $m = 1, 2, 3$ and 4 respectively. The second column represents the best known solutions (BKs) among ACS*, SSA, GVNS and I3CH. Our ILS was tested by performing 10 runs with different random seeds per each instance. We reported the best found (Max) and the average (Avg) objective

function value obtained for each instance. The tables also report the average relative percentage deviation (*AG*), which is the percentage gap between *BK* and the average obtained solution (Avg). We calculate the best relative percentage deviation (*BG*) that represents the percentage gap between *BK* and the best solution obtained (Max). The best known solutions (*BK*s) were collected from ACS, SSA, GVNS and I3CH results. Finally, the average of time spent to obtain the best found *BK* from 10 runs is also reported (Time (seconds)).

The solutions of instance sets "pr01-10" and "pr11-20" are given in Tables 6, 7, 8 and 9. Finally, tables 10, 11 and 12 report the results of "OPT" category.

Table 2: Detailed results of ILS on Solomon's instances with $m = 1$.

Instance Set	BK	ILS		BG (%)	AG (%)	Time (seconds)	Instance Set	BK	ILS		BG (%)	AG (%)	Time (seconds)
		Max	Avg						Max	Avg			
c101	*320*	320	320	0	0	0.2	c201	870	870	870	0	0	36.7
c102	*360*	360	360	0	0	0.3	c202	930	930	930	0	0	59
c103	*400*	400	400	0	0	0.2	c203	960	960	960	0	0	137.2
c104	*420*	420	420	0	0	0.4	c204	980	980	974	0	0.6	217.6
c105	*340*	340	340	0	0	0.4	c205	910	910	908	0	0.2	56.2
c106	*340*	340	340	0	0	0.5	c206	930	930	927	0	0.3	111.5
c107	*370*	370	370	0	0	0.1	c207	930	930	930	0	0	68.1
c108	*370*	370	370	0	0	0.5	c208	950	950	950	0	0	33.3
c109	*380*	380	380	0	0	6.8							
r101	*198*	198	198	0	0	0.1	r201	797	794	788.7	0.4	1	133.7
r102	*286*	286	286	0	0	0.2	r202	930	921	910.3	1	2.1	165.6
r103	*293*	293	293	0	0	1.4	r203	1021	1026	1011.3	-0.5	1	213.5
r104	*303*	303	303	0	0	1.5	r204	1086	1093	1082.8	-0.6	0.3	171
r105	*247*	247	247	0	0	0.7	r205	953	953	948.4	0	0.5	169.9
r106	*293*	293	293	0	0	0.2	r206	1029	1022	1012.4	0.7	1.6	126.5
r107	*299*	299	299	0	0	0.5	r207	1072	1067	1059.5	0.5	1.2	174
r108	*308*	308	308	0	0	0.9	r208	1112	1113	1107.6	-0.1	0.4	165.6
r109	*277*	277	277	0	0	0.2	r209	950	956	949.7	-0.6	0	145.8
r110	*284*	284	284	0	0	1.3	r210	987	978	970.8	0.9	1.6	171.8
r111	*297*	297	297	0	0	10.9	r211	1046	1049	1040.4	-0.3	0.5	145.7
r112	*298*	298	298	0	0	3.3							
rc101	*219*	219	219	0	0	0.2	rc201	795	795	795	0	0	63.5
rc102	*266*	266	266	0	0	0.4	rc202	936	938	929	-0.2	0.7	156.2
rc103	*266*	266	266	0	0	2	rc203	1003	999	989.8	0.4	1.3	111.5
rc104	*301*	301	301	0	0	0.3	rc204	1140	1136	1131.3	0.4	0.8	165
rc105	*244*	244	244	0	0	4.3	rc205	859	859	854.7	0	0.5	100.5
rc106	*252*	252	252	0	0	0.3	rc206	895	899	894.1	-0.4	0.1	152
rc107	*277*	277	277	0	0	0.3	rc207	983	983	952.1	0	3.1	129.9
rc108	*298*	298	298	0	0	0.1	rc208	1053	1057	1040.7	-0.4	1.2	85.6

Table 3: Detailed results of ILS on Solomon's instances with $m = 2$.

Instance Set	BK	ILS		BG (%)	AG (%)	Time (seconds)	Instance Set	BK	ILS		BG (%)	AG (%)	Time (seconds)
		Max	Avg						Max	Avg			
c101	590	590	590	0	0	10.5	c201	1460	1460	1449	0	0.8	153.8
c102	660	660	653	0	1.1	66	c202	1470	1470	1459	0	0.7	222.9
c103	720	720	720	0	0	125.4	c203	1480	1470	1458	0.7	1.5	215.6
c104	760	760	760	0	0	22.5	c204	1480	1480	1474	0	0.4	186.6
c105	640	640	640	0	0	3.4	c205	1470	1470	1465	0	0.3	204.9
c106	620	620	620	0	0	64	c206	1480	1480	1475	0	0.3	235.8
c107	670	670	670	0	0	46.1	c207	1490	1490	1478	0	0.8	233
c108	680	680	680	0	0	22.8	c208	1490	1480	1478	0.7	0.8	240
c109	720	720	720	0	0	11.8							
r101	349	349	349	0	0	8.8	r201	1254	1238	1221.5	1.3	2.6	199.2
r102	508	508	508	0	0	7.6	r202	1347	1326	1314.4	1.6	2.4	216.2
r103	522	522	520.9	0	0.2	87.4	r203	1416	1390	1378.8	1.8	2.6	209.2
r104	552	552	549.7	0	0.4	112.8	r204	*1458*	1456	1445.9	0.1	0.8	192.7
r105	453	453	453	0	0	6.5	r205	1380	1385	1356.3	-0.4	1.7	210.9
r106	529	529	529	0	0	6.7	r206	1440	1438	1418.9	0.1	1.5	170.8
r107	536	538	536.6	-0.4	-0.1	43.4	r207	*1458*	1456	1446.6	0.1	0.8	179.1
r108	560	560	559.8	0	0	73.8	r208	*1458*	1458	1458	0	0	161.6
r109	506	506	505.7	0	0.1	88.1	r209	1405	1406	1388	-0.1	1.2	215.5
r110	525	525	525	0	0	70	r210	1423	1412	1392.3	0.8	2.2	196.9
r111	544	544	543.4	0	0.1	58.3	r211	*1458*	1455	1447.2	0.2	0.7	191.7
r112	544	544	544	0	0	97.5							
rc101	427	427	427	0	0	1	rc201	1384	1380	1368	0.3	1.2	102.9
rc102	505	505	504.5	0	0.1	44.5	rc202	1509	1494	1479.1	1	2	201.8
rc103	524	524	523.7	0	0.1	57.1	rc203	1632	1601	1579.1	1.9	3.2	202.8
rc104	575	575	575	0	0	86.9	rc204	1716	1694	1674.6	1.3	2.4	191.3
rc105	480	480	480	0	0	6.1	rc205	1458	1450	1428.8	0.5	2	183.8
rc106	483	483	483	0	0	77.3	rc206	1546	1552	1525.3	-0.4	1.3	210.7
rc107	534	534	533.7	0	0.1	71.8	rc207	1587	1577	1559.4	0.6	1.7	216.9
rc108	556	556	555.8	0	0	82.7	rc208	1691	1682	1665.4	0.5	1.5	177.5

Table 4: Detailed results of ILS on Solomon's instances with $m = 3$.

Instance Set	BK	ILS		BG (%)	AG (%)	Time (seconds)	Instance Set	BK	ILS		BG (%)	AG (%)	Time (seconds)
		Max	Avg						Max	Avg			
c101	810	810	810	0	0	102.9	c201	*1810*	1810	1800	0	0.6	195.1
c102	920	920	919	0	0.1	176.1	c202	*1810*	1800	1788	0	0.7	236.4
c103	990	980	972	0	0.8	134.4	c203	*1810*	1780	1764	0	0.9	228.6
c104	1030	1030	1015	0	1.5	176.4	c204	*1810*	1800	1785	0	0.8	204.2
c105	870	870	867	0	0.3	106.7	c205	*1810*	1810	1799	0	0.6	233.8
c106	870	870	866	0	0.5	128.5	c206	*1810*	1810	1796	0	0.8	243
c107	910	910	909	0	0.1	66.9	c207	*1810*	1810	1804	0	0.3	233.9
c108	920	920	914	0	0.7	83.6	c208	*1810*	1810	1807	0	0.2	205.8
c109	970	970	958	0	1.2	145.6							
r101	484	484	484	0	0	41.4	r201	1441	1429	1418.6	0	0.7	223
r102	694	691	686.2	0	0.7	98.2	r202	*1458*	1455	1445.9	0	0.6	196.3
r103	747	747	734.2	0	1.7	118	r203	*1458*	1458	1458	0	0	225
r104	777	778	775.1	0	0.4	142.1	r204	*1458*	1458	1458	0	0	205.7
r105	620	620	619.3	0	0.1	77.8	r205	*1458*	1458	1458	0	0	199.2
r106	729	729	723.6	0	0.7	85	r206	*1458*	1458	1458	0	0	143.2
r107	760	759	756.6	0	0.3	156.2	r207	*1458*	1458	1458	0	0	164.8
r108	797	797	796.6	0	0.1	106.6	r208	*1458*	1458	1458	0	0	115.4
r109	710	710	709	0	0.1	72.6	r209	*1458*	1458	1458	0	0	169
r110	737	736	730.8	0	0.7	54.1	r210	*1458*	1458	1458	0	0	162.9
r111	774	774	771.3	0	0.3	76.8	r211	*1458*	1458	1458	0	0	196.3
r112	776	776	772.2	0	0.5	30.5							
rc101	621	621	621	0	0	63.2	rc201	1698	1686	1670.9	0	0.9	188.5
rc102	714	714	710.9	0	0.4	59.9	rc202	*1724*	1715	1706.4	0	0.5	207.3
rc103	764	764	752.3	0	1.5	102.8	rc203	*1724*	1724	1724	0	0	223.8
rc104	834	835	833.1	0	0.2	98.7	rc204	*1724*	1724	1724	0	0	187.9
rc105	682	682	682	0	0	32.1	rc205	1719	1709	1693.9	0	0.9	194
rc106	706	706	705.3	0	0.1	57.8	rc206	*1724*	1724	1723.5	0	0	218.6
rc107	773	772	771	0	0.1	82.8	rc207	*1724*	1724	1724	0	0	190.4
rc108	795	795	795	0	0	49.8	rc208	*1724*	1724	1724	0	0	223.9

Table 5: Detailed results of ILS on Solomon's instances with $m = 4$.

Instance Set	BK	ILS		BG (%)	AG (%)	Time (seconds)	Instance Set	BK	ILS		BG (%)	AG (%)	Time (seconds)
		Max	Avg						Max	Avg			
c101	1020	1020	1011	0	0.9	111.6	c201	*1810*	1810	1810	0	0	193.5
c102	1150	1150	1143	0	0.6	219	c202	*1810*	1810	1810	0	0	224.8
c103	1210	1200	1183	0.8	2.2	212.2	c203	*1810*	1810	1810	0	0	180.4
c104	1260	1250	1232	0.8	2.2	211.2	c204	*1810*	1810	1810	0	0	140.4
c105	1070	1060	1058	0.9	1.1	125	c205	*1810*	1810	1810	0	0	206.7
c106	1080	1070	1062	0.9	1.7	169.6	c206	*1810*	1810	1810	0	0	208.5
c107	1120	1120	1105	0	1.3	176.1	c207	*1810*	1810	1810	0	0	224.8
c108	1130	1130	1122	0	0.7	130.5	c208	*1810*	1810	1810	0	0	214.2
c109	1190	1190	1177	0	1.1	158.8							
r101	611	611	611	0	0	60	r201	*1458*	1458	1458	0	0	191.7
r102	843	837	827.9	0.7	1.8	94.3	r202	*1458*	1458	1458	0	0	166.2
r103	928	920	904.1	0.9	2.6	149	r203	*1458*	1458	1458	0	0	180.3
r104	972	973	963.1	-0.1	0.9	120.8	r204	*1458*	1458	1458	0	0	138.9
r105	778	778	772	0	0.8	65.6	r205	*1458*	1458	1458	0	0	147.8
r106	906	906	893.1	0	1.4	155.1	r206	*1458*	1458	1458	0	0	153.4
r107	950	947	938.2	0.3	1.2	99.1	r207	*1458*	1458	1458	0	0	104.4
r108	994	992	988.6	0.2	0.5	103.9	r208	*1458*	1458	1458	0	0	144.6
r109	885	885	876.6	0	0.9	99.7	r209	*1458*	1458	1458	0	0	186.6
r110	915	904	893.7	1.2	2.3	120.2	r210	*1458*	1458	1458	0	0	111.7
r111	952	947	943.8	0.5	0.9	131.2	r211	*1458*	1458	1458	0	0	101.6
r112	971	969	962.3	0.2	0.9	91.5							
rc101	811	811	810.4	0	0.1	101.1	rc201	*1724*	1724	1723.8	0	0	187.3
rc102	908	906	896.6	0.2	1.3	100.7	rc202	*1724*	1724	1724	0	0	176.4
rc103	974	972	959	0.2	1.5	127.9	rc203	*1724*	1724	1724	0	0	204.5
rc104	1064	1054	1039.7	0.9	2.3	121.5	rc204	*1724*	1724	1724	0	0	180
rc105	875	875	869.2	0	0.7	67.3	rc205	*1724*	1724	1724	0	0	188
rc106	909	909	905.9	0	0.3	116	rc206	*1724*	1724	1724	0	0	161.5
rc107	980	985	979.6	-0.5	0	110.6	rc207	*1724*	1724	1724	0	0	208.5
rc108	1025	1025	1020.2	0	0.5	101.1	rc208	*1724*	1724	1724	0	0	162.5

Table 6: Detailed results of ILS on Cordeau's instances with $m = 1$.

Instance Set	BK	ILS		BG (%)	AG (%)	Time (seconds)	Instance Set	BK	ILS		BG (%)	AG (%)	Time (seconds)
		Max	Avg						Max	Avg			
pr01	*308*	308	308	0	0	0.5	pr11	353	353	352.8	0	0.1	80.7
pr02	*404*	404	404	0	0	37.7	pr12	442	441	440.8	0.2	0.3	90.5
pr03	*394*	394	394	0	0	8.1	pr13	466	458	456.9	1.7	2	114.9
pr04	*489*	489	486.2	0	0.6	121.4	pr14	567	552	549	2.6	3.2	92.9
pr05	*595*	591	589.3	0.7	1	98.8	pr15	707	707	687.7	0	2.7	130.7
pr06	591	586	574.7	0.8	2.8	57.3	pr16	674	650	637.2	3.6	5.5	147.3
pr07	*298*	298	298	0	0	1.4	pr17	362	362	362	0	0	44.7
pr08	*463*	463	463	0	0	3.9	pr18	539	539	539	0	0	29
pr09	*493*	493	491.8	0	0.2	85	pr19	562	549	543.2	2.3	3.3	104.6
pr10	594	583	577.1	1.9	2.8	90.4	pr20	667	648	638.6	2.8	4.3	143.1

Table 7: Detailed results of ILS on Cordeau's instances with $m = 2$.

Instance Set	BK	ILS		BG (%)	AG (%)	Time (seconds)	Instance Set	BK	ILS		BG (%)	AG (%)	Time (seconds)
		Max	Avg						Max	Avg			
pr01	502	502	502	0	0	6.2	pr11	566	566	564.2	0	0.3	44.8
pr02	715	706	698.6	1.3	2.3	114.2	pr12	774	766	760	1	1.8	129.3
pr03	742	742	735.2	0	0.9	119.5	pr13	832	831	824.9	0.1	0.9	155.1
pr04	925	920	907.8	0.5	1.9	128.3	pr14	1017	989	962.1	2.8	5.4	200.2
pr05	1101	1093	1061.5	0.7	3.6	211	pr15	1219	1220	1172.3	-0.1	3.8	183.9
pr06	1076	1046	1009.8	2.8	6.2	170.5	pr16	1231	1140	1124.4	7.4	8.7	173.2
pr07	566	566	566	0	0	42.5	pr17	652	646	645.1	0.9	1.1	88.5
pr08	834	832	818.8	0.2	1.8	130.4	pr18	938	936	922.7	0.2	1.6	133.5
pr09	905	902	886	0.3	2.1	156.9	pr19	1034	1009	984.7	2.4	4.8	171.8
pr10	1129	1109	1080.8	1.8	4.3	185.3	pr20	1232	1210	1164.1	1.8	5.5	221.3

Table 8: Detailed results of ILS on Cordeau's instances with $m = 3$.

Instance Set	BK	ILS		BG (%)	AG (%)	Time (seconds)	Instance Set	BK	ILS		BG (%)	AG (%)	Time (seconds)
		Max	Avg						Max	Avg			
pr01	622	619	617.5	0	0.2	57.9	pr11	654	654	653.7	0	0	80.2
pr02	942	937	922.7	0	1.5	149.6	pr12	1002	988	972.9	0	1.5	199.8
pr03	1010	1003	983.6	0	1.9	181.6	pr13	1145	1140	1119.1	0	1.8	197.4
pr04	1294	1264	1250.5	0	1.1	182.9	pr14	1372	1353	1308.7	0	3.3	186.4
pr05	1482	1442	1404.6	0	2.6	228.9	pr15	1654	1621	1596.3	0	1.5	199.9
pr06	1514	1424	1400.8	0	1.6	218.9	pr16	1668	1575	1545.3	0	1.9	206.4
pr07	744	744	737.9	0	0.8	139.9	pr17	841	837	830.3	0	0.8	122
pr08	1139	1116	1099.8	0	1.5	154.9	pr18	1281	1246	1229.1	0	1.4	167.6
pr09	1275	1238	1215.3	0	1.8	219.2	pr19	1417	1365	1342	0	1.7	217.2
pr10	1573	1515	1486	0	1.9	223.3	pr20	1684	1633	1605.9	0	1.7	214.9

Table 9: Detailed results of ILS on Cordeau's instances with $m = 4$.

Instance Set	BK	ILS		BG (%)	AG (%)	Time (seconds)	Instance Set	BK	ILS		BG (%)	AG (%)	Time (seconds)
		Max	Avg						Max	Avg			
pr01	657	657	657	0	0	104.4	pr11	657	657	657	0	0	147.9
pr02	1079	1066	1052	1.2	2.5	191.4	pr12	1132	1115	1098.8	1.5	2.9	184
pr03	1232	1211	1188.9	1.7	3.5	181.4	pr13	1386	1364	1322.9	1.6	4.6	231.1
pr04	1585	1536	1511.7	3.1	4.6	245.6	pr14	1670	1626	1596.3	2.6	4.4	218.7
pr05	1838	1784	1725.4	2.9	6.1	225.2	pr15	2065	1951	1922.3	5.5	6.9	194.5
pr06	1860	1790	1757.4	3.8	5.5	210.1	pr16	2065	1935	1897.7	6.3	8.1	205.9
pr07	876	874	860.3	0.2	1.8	131.1	pr17	934	925	920.2	1	1.5	166.3
pr08	1382	1351	1329.8	2.2	3.8	185.8	pr18	1539	1484	1452.7	3.6	5.6	228.7
pr09	1619	1547	1513.5	4.4	6.5	210.4	pr19	1750	1688	1665.8	3.5	4.8	235.2
pr10	1943	1871	1833.5	3.7	5.6	214.3	pr20	2062	1990	1950.5	3.5	5.4	201

Table 10: Detailed results of ILS on new Solomon100's instances

Instance Set	m	BK	ILS		BG (%)	AG (%)	Time (seconds)
			Max	Avg			
c101	10	*1810*	1760	1738.0	2.76	3.98	137.1
c102	10	*1810*	1810	1806.0	0.00	0.22	198.4
c103	10	*1810*	1810	1810.0	0.00	0.00	171.1
c104	10	*1810*	1810	1810.0	0.00	0.00	153.2
c105	10	*1810*	1810	1790.0	0.00	1.10	188.7
c106	10	*1810*	1800	1784.0	0.55	1.44	201.6
c107	10	*1810*	1810	1804.0	0.00	0.33	254.9
c108	10	*1810*	1810	1809.0	0.00	0.06	243.1
c109	10	*1810*	1810	1810.0	0.00	0.00	211.9
r101	19	*1458*	1457	1450.8	0.07	0.49	182.9
r102	17	*1458*	1453	1448.8	0.34	0.63	188.1
r103	13	*1458*	1453	1444.1	0.34	0.95	170.2
r104	9	*1458*	1430	1420.7	1.92	2.56	205.1
r105	14	*1458*	1458	1446.3	0.00	0.80	171.2
r106	12	*1458*	1452	1440.3	0.41	1.21	166.3
r107	10	*1458*	1444	1433.1	0.96	1.71	203.6
r108	9	*1458*	1451	1441.2	0.48	1.15	203.5
r109	11	*1458*	1449	1436.2	0.62	1.50	210.7
r110	10	*1458*	1443	1436.7	1.03	1.46	207.9
r111	10	*1458*	1450	1436.7	0.55	1.46	207.9
r112	9	*1458*	1449	1440.3	0.62	1.21	191.3
rc101	14	*1724*	1708	1692.8	0.93	1.81	165.1
rc102	12	*1724*	1695	1687.3	1.68	2.13	188.9
rc103	11	*1724*	1719	1708.3	0.29	0.91	174.6
rc104	10	*1724*	1724	1716.6	0.00	0.43	191.3
rc105	13	*1724*	1709	1697.6	0.87	1.53	158.5
rc106	11	*1724*	1702	1686.1	1.28	2.20	186.7
rc107	11	*1724*	1722	1716.0	0.12	0.46	179.9
rc108	10	*1724*	1719	1713.3	0.29	0.62	191.4

Table 11: Detailed results of ILS on new Solomon200's instances

Instance Set	m	BK	ILS		BG (%)	AG (%)	Time (seconds)
			Max	Avg			
c201	4	*1810*	1810	1810.0	0.00	0.00	179.3
c202	4	*1810*	1810	1810.0	0.00	0.00	223.5
c203	4	*1810*	1810	1810.0	0.00	0.00	157.6
c204	4	*1810*	1810	1810.0	0.00	0.00	180.6
c205	4	*1810*	1810	1810.0	0.00	0.00	231.2
c206	4	*1810*	1810	1810.0	0.00	0.00	188.3
c207	4	*1810*	1810	1810.0	0.00	0.00	185.3
c208	4	*1810*	1810	1810.0	0.00	0.00	205.0
r201	4	*1458*	1458	1458.0	0.00	0.00	202.2
r202	3	*1458*	1458	1440.9	0.00	1.17	181.9
r203	3	*1458*	1458	1458.0	0.00	0.00	180.2
r204	2	*1458*	1449	1444.2	0.62	0.95	185.5
r205	3	*1458*	1458	1458.0	0.00	0.00	183.1
r206	3	*1458*	1458	1458.0	0.00	0.00	188.2
r207	2	*1458*	1456	1448.8	0.14	0.63	207.5
r208	2	*1458*	1458	1458.0	0.00	0.00	150.1
r209	3	*1458*	1458	1458.0	0.00	0.00	198.3
r210	3	*1458*	1458	1458.0	0.00	0.00	180.0
r211	2	*1458*	1455	1443.4	0.21	1.00	202.4
rc201	4	*1724*	1724	1724.0	0.00	0.00	185.5
rc202	3	*1724*	1714	1707.0	0.58	0.99	195.7
rc203	3	*1724*	1724	1724.0	0.00	0.00	189.5
rc204	3	*1724*	1724	1724.0	0.00	0.00	182.7
rc205	4	*1724*	1724	1724.0	0.00	0.00	201.6
rc206	3	*1724*	1724	1721.4	0.00	0.15	163.8
rc207	3	*1724*	1724	1724.0	0.00	0.00	203.9
rc208	3	*1724*	1724	1724.0	0.00	0.00	167.3

Table 12: Detailed results of ILS on new Cordeau's instances

Instance Set	m	BK	ILS		BG (%)	AG (%)	Time (seconds)
			Max	Avg			
pr01	3	*657*	619	615.3	5.78	6.35	107.4
pr02	6	*1220*	1198	1188.6	1.80	2.57	208.4
pr03	9	*1788*	1760	1747.6	1.57	2.26	235.0
pr04	12	*2477*	2454	2436.8	0.93	1.62	185.8
pr05	15	*3351*	3331	3322.5	0.60	0.85	220.5
pr06	18	*3671*	3644	3636.4	0.74	0.94	160.9
pr07	5	*948*	941	933.0	0.74	1.58	132.5
pr08	10	*2006*	2006	1997.5	0.00	0.42	206.6
pr09	15	*2736*	2736	2732.8	0.00	0.12	213.5
pr10	20	*3850*	3850	3847.4	0.00	0.07	185.8

References

1. Q. Hu, A. Lim, An iterative three-component heuristic for the team orienteering problem with time windows, European Journal of Operational Research 232 (2) (2014) 276–286.
2. G. Righini, M. Salani, Decremental state space relaxation strategies and initialization heuristics for solving the orienteering problem with time windows with dynamic programming, Computers and Operations Research 36 (4) (2009) 1191–1203.
3. R. Montemanni, L. Gambardella, Ant colony system for team orienteering problem with time windows, Foundations of Computing and Decision Sciences 34 (4) (2009) 287–306.
4. P. Vansteenwegen, W. Souffriau, G. V. Berghe, D. van Oudheusden, Iterated local search for the team orienteering problem with time windows, Computers and Operations Research 36 (12) (2009) 3281–3290.
5. R. Montemanni, D. Weyland, L. M. Gambardella, in: Proceedings of 2011 International Symposium on Computer Science and Society (ISCCS), 2011, pp. 381–384.
6. S. W. Lin, V. F. Yu, A simulated annealing heuristic for the team orienteering problem with time windows, European Journal of Operational Research 217 (1) (2012) 94–107.
7. N. Labadie, R. Mansini, R. Melechovskỳ, J.and Calvo, The team orienteering problem with time windows: an lp-based granular variable neighborhood search, European Journal of Operational Research 220 (1) (2012) 15–27.
8. N. Labadie, R. Mansini, R. Melechovskỳ, J.and Calvo, Hybridized evolutionary local search algorithm for the team orienteering problem with time windows, Journal of Heuristics 17 (6) (2011) 729–753.